Course Information

Division: Industrial Technology Education
Course Number: ELT 171
Title: Process Control Instrumentation
Credits: 3
Developed by: Charles A. Smith
Lecture/Lab Ratio: 1 Lecture/4 Lab
Transfer Status:

<table>
<thead>
<tr>
<th></th>
<th>ASU</th>
<th>NAU</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Transferable</td>
<td>CTE Departmental Elective</td>
<td>Not Transferable</td>
<td></td>
</tr>
</tbody>
</table>

Activity Course: No
CIP Code: 47.0105
Assessment Mode: Pre/Post Test (38 Questions/100 Points)
Semester Taught: Spring
GE Category: None
Separate Lab: No
Awareness Course: No
Intensive Writing Course: No

Prerequisites
ELT 161 or concurrent enrollment in ELT161

Educational Value
A. General Education: Elective Credit.
B. Other courses or curricula: This course is a curriculum requirement for the Electrical and Instrumentation Technology certificate and Associate of Applied Science Degree.

Description
This course is an introductory course into the basic principles of Process Control Instrumentation. This course examines the various industrial processes and how to control them through the use of electrical, electronic, and pneumatic automatic controllers. Course involves each student in different modes of process controls such as on/off and proportional and integral and derivative modes. It also deals with interfacing process measurement signals to controller inputs and connecting controller outputs to a final control element.

Supplies
Scientific calculator recommended
Competencies and Performance Standards

1. Analysis of the basic process control loop theory

   **Learning objectives**
   
   *What you will learn as you master the competency:*
   
   a. Familiarization to principles of feedback.
   b. Implementation of process controllers.
   c. Interfacing of controller inputs.
   d. Interfacing of controller outputs.
   e. Utilization of final control elements.
   f. Comprehension of proportional, integral and derivative functions.
   g. Implementation of on/off control techniques.
   h. Analysis of reverse and direct acting controllers.

   **Performance Standards**
   
   *Competence will be demonstrated:*
   
   o in written examinations
   o in class discussion
   o in group practice
   o by using model electrical circuits

   *Criteria - Performance will be satisfactory when:*
   
   o learner completes written test to a 70%
   o learner manipulates model circuit to accomplish assigned task

2. Examination of advanced control methods.

   **Learning objectives**
   
   *What you will learn as you master the competency:*
   
   a. Analysis of ratio control.
   b. Demonstrate knowledge or feedforward control.
   c. Familiarization of cascade control systems.
   d. Familiarization of multivariable control.
   e. Investigating sequential control methods.
   f. Investigating feed water control systems.

   **Performance Standards**
   
   *Competence will be demonstrated:*
   
   o in class discussion
   o in group practice
   o by using model electrical circuits
   o in written tests

   *Criteria - Performance will be satisfactory when:*
   
   o learner completes written test with a 70% or better
   o learner manipulates model circuit to accomplish assigned task
3. **Analyze process control systems**

**Learning objectives**

*What you will learn as you master the competency:*

- Familiarization with SCADA, RTU, and DCS systems.
- Analysis of a single loop system.
- Examine the use of data transmission and telemetry.
- Implementation of multiplexing signals.

**Performance Standards**

*Competence will be demonstrated:*

- in class discussion
- in group practice
- by using model electrical circuits
- in written tests

*Criteria - Performance will be satisfactory when:*

- learner completes written test with a 70% or better
- learner manipulates model circuit to accomplish assigned task

**Types of Instruction**

Lecture/modeling

Instrumentation lab assignments

Group practice

Individual projects/presentations

**Grading Information**

**Grading Rationale**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post/Final Exam</td>
<td>35%</td>
</tr>
<tr>
<td>Chapter Exams</td>
<td>35%</td>
</tr>
<tr>
<td>Lab Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Attendance</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Grading Scale**

- **A** 90%–100%
- **B** 80%-89%
- **C** 70%-79%
- **D** 60%-69%
- **F** Below 59%